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The following communications were read :—

I. A Letter from Mr. Rumker to Sir James South, on the appearances of Stars on the Moon's Disc. The following is an extract :—

" The first is the appearance seen by Sir Thomas Brisbane and myself, 30th July, 1821. From the position of the moon's dark limb towards Regulus, I concluded that she would eclipse the star before setting, and apprised Sir Thomas Brisbane of it, who made the observation, whilst I attended to the time. Nothing particular appears to have been noticed by him at the immersion of the star behind the dark limb, which was particularly conspicuous at the time; but, after the emersion, he was astonished to see Regulus upon the moon's disc; and being invited by him to look at the star through the glass, I certainly observed the star, according to my estimation, upwards of 2′ inside of the moon's enlightened limb, where it remained sufficiently long for Sir Thomas and myself to exchange the telescope several times, and admire in turns the singular phenomenon.

" I must remark here, that on account of being afloat at the time, sailing along the coast of Cape Frio, which bore W.N.W. ½W., distant about 5 miles, Sir Thomas Brisbane could only make use of a comet-sweeper for the observation, which may have been influenced thereby. Moreover, it was broad daylight, the sun having just set; but as Professor Wurm has deduced from the immersion and emersion respectively the following conjunctions,

	Mean time.			Conjunction.		
	h	m	s	h	m	s
Immersion	6	2	52,4	4	18	10,08
Emersion	6	12	59,7	4	18	5,74

(The star described a very small chord over the moon's disc.)

the observation cannot have been a bad one. Professor Wurm deduces thence the longitude of Cape Frio, 41° 46′ W. from Greenwich. Regulus was visible to the naked eye before the observation.

" In Bode's *Jahrbuch* for 1822, I find the following observation, made by Professor Burg, in Vienna, in a letter from the observer to Professor Bode, related as follows :—

" ' 1819, April 13. Emersion of α m from the moon's dark limb at $12^h\ 3^m\ 22^s$ to 23^s apparent time.

" ' At $23^h\ 3^m\ 17^s,1$ apparent time, I observed the emersion of a star 6·7 mag., which, about 5″ after, suddenly appeared to me like a star of the first magnitude; and it is from this transition that

I have dated the time of emersion. Perhaps Antares is a double star, and the first observed small one is so near the principal star, that both, viewed even through a good telescope, do not appear separated.'

"To this Bode remarks: 'Antares is no double star, and I explain the appearance observed by Professor Burg thus—that the star first appeared through the vapours of the moon's atmosphere at her dark limb, along which, however rare it may be, this atmosphere must have occupied a long track in the direction of the rays that entered the observer's eye from Antares, which, when clear thereof, suddenly appeared in its full splendour.'

"It is perhaps presumptuous to venture an explanation of a phenomenon so maturely examined by you. But you will not scrupulously criticise an hypothesis imparted by me to you. You know I forgot to take with me your interesting memoir when I left Camden Hill last; so that I cannot peruse it now. But I think the phenomenon has principally been observed upon the bright limb. Had now, in the above instance of Antares, that limb of the moon behind which the star emerged been enlightened, the moon's atmosphere would also have been enlightened, and have become visible to us, appearing a continuation of the moon's limb, but sufficiently transparent for us to have seen the star through it; so that, after observing its emersion, we still should have seen it within what we considered to be the moon's disc. Thus was it in the instance of Regulus, observed by Sir Thomas Brisbane and myself; and the long duration on that occasion was owing to the oblique direction in which the star traversed the annulus of the atmosphere.

"Astronomers have always deduced a smaller moon's diameter from eclipses of the sun than from meridian observations of the moon, and ascribe this to the inflexion, which is a confirmation of my hypothesis. We observe the contact of the moon's atmosphere with the wire, whilst we observe the encroachment of the moon's opaque body upon the sun.

"This phenomenon has principally been observed with the brighter stars, because the rays of the smaller ones could not pierce the atmosphere, and also do not always disappear suddenly at their immersions at the bright limb."

II. A paper on Irradiation, by Dr. Robinson, of Armagh.

That irradiation is variable, is shewn by examining a series of the sun's diameters in right ascension. Dr. Robinson has observed, that when the observation is made through cloud or haze, a small diameter is given, the difference from the tabular diameter being the same for different apertures. By deducing from a large number of lunar transits the *probable* error of the observer, Dr. Robinson finds that, in his own case, this is only two-thirds of what really occurs, leaving unexplained an error of $0^s,155$ in the moon's right ascension, which he conceives may have arisen from changes of irradiation. Assuming the probable errors of the observers at Paris and Greenwich as less than his own, he finds a similar unexplained error of $0^s,195$.

By comparing the longitude of Armagh with that of several other observatories, as Kœnigsberg, Greenwich, Cambridge, and Paris, the observers are found to differ as to the moon, by a quantity varying from $0^s,39$ to $0^s,6$. Dr. Robinson then proceeds to shew the fact of changes in the quantity of irradiation, which may explain this, by the following experiments. A small circular hole, in a slip of brass, is placed in the focus of an object-glass, and viewed with a telescope through that object-glass. To make this hole, two slips are ground to fit closely, a hole is drilled through both, which is widened with a taper broach, and finished by grinding with a wire of the same size, and fine emery. Of these, that whose least section is at the surface of contact must be taken. The telescope used had a triple object-glass, of 47 inches focal length, and 2·75 aperture.

Dr. Robinson adds—"On looking through it when they were properly placed, the little hole, illuminated by a lamp behind it, appeared as a disc 17′ diameter, yellow, and something brighter than the sun in my transit observations of last month, but with a much more distinct and sharp limb than the sun presents, except in the most favourable state of the air. Then placing before the lamp a slip of oiled paper, its appearance became like that of the moon in a dense fog, perfectly well defined and visible, but without splendour, and looking like dead silver. In this state I made the micrometer wires internal tangents to the disc; and having the paper removed, I saw with pleasure two segments of the disc instantly project beyond the wires, and making the contact anew, had the measure of the enlargement of its diameter."

The excesses thus determined varied from $4'',8$ to $5'',9$, and with a disc of 11′ 20″, from $4'',85$ to $5'',8$. With a divided object-glass micrometer, the contact of the images was unaffected by their brightness or obscurity.

Here Dr. Robinson remarks—"If I have made no mistake, it shews that the whole of this irradiation was ocular, as there cannot be any sympathetic affection from one image of those adjacent parts of the retina which are already stimulated by the other. It also seems to shew that the projection of stars on the moon does not proceed from irradiation."

In applying a ten-foot Newtonian, it was found impossible to procure sufficient illumination; and a larger hole, viewed through the transit with a power of 156, gave excesses varying from $3'',72$ to $4'',76$. The illumination of the field of view had no effect on the disc in its brightest state, though it had on the obscure phase.

Dr. Robinson concludes, that irradiation originates chiefly in the eye, and that it is lessened by *strongly* illuminating the field of view. He recommends observing by reducing the aperture of the object-glass by a semitransparent diaphragm of oiled paper, which should fill the field with *scattered* light. By this means he has reduced the error in the sun's diameter from $0'',07$ to $0'',008$, and thinks it may be reduced still further by a diaphragm of emeried glass.

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